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## *PSYCHOSOCIAL AND HEALTH CORRELATES OF TYPES OF TRAUMATIC EVENT EXPOSURES AMONG U.S. MILITARY PERSONNEL*

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# Psychosocial and Health Correlates of Types of Traumatic Event Exposures among U.S. Military Personnel

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The prevalence of lifetime exposure to violence, natural disaster, or major accidents involving injuries or fatalities was examined in the largest population-based epidemiologic survey of U.S. military personnel to date. The psychosocial and health effects of types of exposure experience (witness only, victim/survivor, relief worker), gender differences, and social support were also evaluated. Over 15,000 active duty U.S. military personnel from stratified random samples of active duty U.S. personnel from all services responded to either mail questionnaires and/or worksite surveys. The lifetime exposure to one or more traumatic events was 65%; the most prevalent trauma for men was witnessing a major accident, and for women, witnessing a natural disaster. Victims of any traumatic event were at twice the risk of having two or more physical and mental health problems than nonexposed controls. Health outcomes of trauma exposure vary by type of traumatic event: type of exposure experience, rank, and gender.

## Introduction

Reviews of epidemiologic studies of trauma show that exposure to traumatic events is highly prevalent in the United States.<sup>1,2</sup> The prevalence of lifetime exposure to at least one traumatic event has varied widely from an estimated 37% to 87% of women and from 43% to 92% of men, depending on how the exposure is measured.<sup>3</sup> In a study of more than a thousand 21- to 30-year-old health maintenance organization members in Detroit, more than one-third had already experienced at least one traumatic event.<sup>4</sup> Men are more likely to report experiencing combat or threat with a weapon, life-threatening accident, and natural disaster, and women are more likely to report sexual assault and rape.<sup>1</sup> Military personnel may be considered high risk for occupational exposure to traumatic events, especially through combat or other operational mission experience. However, little is known about the prevalence of trauma exposure or its consequences in this population.

Although the most frequently studied psychological effect of trauma exposure is post-traumatic stress disorder (PTSD), the estimated lifetime prevalence rate of 1% to 12% is relatively low in the general population<sup>2</sup> and has been estimated to be approximately 12% among active duty Navy and Marine Corps personnel.<sup>5</sup> Individuals exposed to traumatic events often have mental disorders other than PTSD, including general psychological dis-

tress<sup>6</sup> or emotional/behavioral disturbances.<sup>7,8</sup> For example, a study by Carr et al.<sup>9</sup> found that, whereas 18% of the adult population that was highly exposed to the 1989 Newcastle (Australia) earthquake was estimated to have PTSD, 25% to 28% experienced moderate to severe psychological distress. Trauma victims also may experience marital, social, occupational, financial, and health problems that may seriously impact personnel readiness and military performance.<sup>2</sup> Although clinical studies abound, few population-based epidemiologic investigations have examined these more general and potentially more prevalent psychosocial and health-related correlates of exposure to traumatic events. This is the first epidemiologic study of trauma exposure that investigates the inter-relationships among a wide range of such health and psychosocial consequences in a large population-based sample of healthy, active duty military personnel.

Since the risk of PTSD among trauma victims appears to vary depending on the type of trauma exposure (i.e., the risk is greater after exposures involving violence than after other forms of trauma),<sup>1</sup> it is likely that other consequences may also be influenced by the type of event. Although many studies have examined the effects of specific traumas,<sup>10-17</sup> few studies have systematically compared psychosocial and health effects across types of traumatic event exposures. Therefore, the present study compares exposure outcomes by types of traumatic event (combat and violence, natural disaster, and major accidents involving injuries or fatalities).

Also, little is known about the influence of the nature or type of exposure experience to a particular trauma on the relationship between traumatic events and psychosocial and health outcomes. In one of the few studies that attempted to quantify the type or degree of exposure experience, it was found that, among several groups exposed to the 1989 Newcastle earthquake (e.g., the injured, the displaced, owners of damaged businesses, helpers), only the injured and the displaced had higher levels of psychological morbidity than those in the other groups.<sup>9</sup> In a study of the effects of Mount St. Helen's volcanic eruption, bereaved subjects, but not subjects who lost their homes, reported lower levels of mental health; neither reported poorer physical health than controls.<sup>18</sup> These findings suggest that the type of exposure experience should also be considered when examining psychosocial consequences of traumatic events. Thus, the present study also examines the relationship between type of exposure experience (witness, survivor/victim, and relief worker) and various outcome measures.

The study addressed five main questions. (1) What is the prevalence of exposure to traumatic events in this population? (2) How do military men and women vary with regard to their exposure and its effects? (3) What are the effects of trauma exposure on mental and physical health? (4) Do different types

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of trauma exposure produce different levels and types of psychological and physical health consequences? (5) To what extent are the psychological and physical consequences of trauma exposure influenced by the type of exposure experienced by the individual? It was hypothesized that psychosocial and health effects will vary (1) by type of traumatic event (combat and violence traumas being associated with poorer perceived health and psychosocial functioning than natural disasters or major accidents) and (2) by type of exposure experience (survivors/victims having poorer perceived health and psychosocial functioning than witnesses or relief workers).

## Methods

### Data Source and Sample

This study draws on a combined dataset from two large-scale studies: (1) the 1998 Health Status of Military Women and Men in the Total Force, also called Total Force Health Assessment<sup>19</sup> and (2) the 1995 Perception of Wellness and Readiness Assessment.<sup>20</sup> The Total Force Health Assessment surveyed all segments of the military, except active duty Navy and Marine Corps personnel, who were studied using the 1995 Perception of Wellness and Readiness Assessment. In combination, these two surveys provide one of the first sets of health status results for personnel from all segments of the military. Participants were selected to represent women and men in all pay grades of all segments of the U.S. military throughout the world. Those included in the present study were active duty members of all branches of military service stratified by service, sex, pay grade group, race/ethnicity, and location. The sampling frame consisted of a random sampling design of person-level records obtained from the Defense Manpower Data Center.<sup>21</sup> A Defense Manpower Data Center sample planning tool, developed by RTI, was used to develop the sample allocation.<sup>22</sup> A disproportionate allocation of the total sample to the design strata was provided based on the distribution of the strata variables, the stratum sizes, precision constraints (domain proportions set to 0.10 and confidence interval half-width of 0.034 for most domains), and the variable survey costs in each of the strata.

### Procedures

For the mail portion of the survey, three questionnaire mailings were conducted with a reminder/thank you postcard sent between mailings. Introductory letters of study support provided by high-ranking officials of each service were included in the mail packets along with informed consent forms. The majority of responses were from mailed questionnaires, and a small percentage of the Navy and Marine Corps responses were from a subsample of group worksite questionnaire administrations. A total of 3,363 Army, 2,300 Air Force, 7,755 Navy, and 1,742 Marine Corps personnel responded to the surveys, representing a population of 1,350,882 active duty personnel. The overall response rate for eligible persons returning a usable questionnaire was 38.0% for total force and 39.6% for 1995 Perception of Wellness and Readiness Assessment. Sampling weights were estimated by matching completed records to the sampling frame using the questionnaire information and were calculated as the inverse of the probability of the selection into the sample. Although respondents closely represented the original population

on most demographic variables, a nonresponse adjustment was made to the sampling weights to compensate for a lower response rate in some age and sex groupings and the disproportionate allocation of the sampling design. Details of the probability sampling design and survey methodology have been reported elsewhere.<sup>19,23</sup> To properly compute sampling weights, only responses with complete data on strata variables were included in the present analyses.

### Measures

Exposure to traumatic events was assessed by three items specifically developed for this study. Respondents were asked whether they had ever been exposed to a natural disaster, combat or violence, or a major accident involving injuries or fatalities, and, if so, was it as a witness, survivor/victim, or participant in aid, cleanup, rescue, or investigation (i.e., relief worker). On the basis of examination of overall prevalence rates and similar distributions of characteristics, three exposure groups were examined: those with a lifetime exposure to combat or violence only, those with a lifetime exposure to a natural disaster or major accident only, and a combined group of those with a lifetime exposure to any combat or violence, natural disaster, or major accident involving injuries or fatalities. The present study summarizes findings from the latter group. Because only a small number of respondents reported exposure to combat by using deadly force as part of their job in the military and their responses did not differ from those of personnel exposed to other forms of violence, they are not presented separately.

The medical history portion of the questionnaire consisted of 28 medical conditions that were adapted from the National Health and Nutrition Examination Survey and excluded conditions primarily associated with the elderly, such as stroke and osteoporosis.<sup>24</sup> Respondents indicated whether a health care provider had ever told them they had any of these conditions. A summary variable of the total number of current medical conditions was created based on the number of positive responses to questionnaire items inquiring whether the respondent still had the condition.

Health care use was assessed with three items asking about the number of times personnel went to a military medical facility for their own health care during the past 12 months and by three items asking about the number of times personnel went to a civilian doctor's office or outpatient clinic. These items were adapted from the 1994-1995 Health Care Survey of Department of Defense Beneficiaries.<sup>21</sup> The number of civilian and military facility visits for illness or injury or follow-up for illness or injury were combined into one measure, and visits for civilian and military facility mental health visits were combined into a second measure.

Perceived physical health status was assessed with three of the scales from the Rand 36-Item Health Survey (Version 1.0) adapted from the Medical Outcomes Study.<sup>25</sup> The first scale consisted of five items and tapped general health perceptions. The second scale consisted of four items and assessed role limitations due to physical health. The third scale consisted of three items assessing role limitations due to emotional problems. These scales have been found to have good reliability and are scored from 0 to 100, with 100 representing optimal health status.<sup>26</sup>

Depressive symptomatology was assessed with a shortened

version of the Center for Epidemiologic Studies-Depression Scale. The four-point (0-3) scale ranges from rarely or none of the time (less than 1 day) to most or all of the time (5-7 days) and inquires about how often respondents "have felt this way during the past 7 days."<sup>27-29</sup> Seven items are scored such that the higher the score, the more depressive symptomatology indicated by the respondent. This index correlates 0.92 with the full Center for Epidemiologic Studies-Depression Scale and has a reliability of  $\alpha = 0.83$ .<sup>30</sup> A cutoff score of 5 was used as an indicator of need for further depression evaluation.<sup>19</sup>

Perceived quality of life was assessed with a single item inquiring how respondents felt about their "life as a whole" adapted from Andrews and Withey.<sup>31</sup> Response options ranged from terrible/unhappy (0) to pleased/delighted (4).

Positive and negative life events were assessed with two items taken from the U.S. Army's Fit to Win Health Risk Appraisal (DA form 5676). One item asked about the number of serious personal losses or difficult problems personnel had to handle in the past year. A four-point response scale ranged from none (0) to several (3). One item inquired how often they experienced a major pleasant change in the past year. Four response options ranged from never (0) to often (3).

Suicidal ideation was also assessed with an item taken from the Army's Health Risk Appraisal that inquired whether the respondent had seriously considered suicide within the past 2 years. Recency of suicidal ideation was assessed by affirmative responses indicating that this had occurred within the past year and within the past 2 months.

Perceived job stress was assessed with the 12-item Job Pressures Scale.<sup>32</sup> Respondents were asked to indicate how often they were "bothered" by the pressure or stresses of their job on a five-point scale ranging from not at all (0) to nearly all the time (4).<sup>4</sup> An overall score was obtained by summing and averaging the raw subscale scores.<sup>33</sup>

Cigarette use was assessed by items concerned with amount and frequency of smoking tobacco and adapted from items used in the 1992 Worldwide Survey of Substance Abuse and Health Behaviors among Military Personnel.<sup>34</sup> Military personnel defined as current smokers reported having smoked at least 100 cigarettes in their lifetime and having smoked in the past 30 days.

Measures of alcohol use included the number of days that alcohol was consumed in the past 30 days and the number of alcoholic drinks consumed on a typical day in the past 30 days. These items were also adapted from the 1992 Worldwide Survey of Substance Abuse and Health Behaviors among Military Personnel.<sup>34</sup>

Because of the large number of categorical outcome variables, three summary outcome measures guided by principal component analysis were constructed. Based on loading weights of the 15 variables above, intercorrelated measures were summed (positive, 1) within each factor to yield the number of positive factor items. These summary variables were (1) mental health (including depression, mental health visit, role limitation due to emotional problems, suicidal ideation, feelings about life as a whole, positive and negative life events, high job stress); (2) substance use (including current smoker, frequency, and amount of alcohol use); and (3) physical health (including per-

ceived health status, illness/injury visit, role limitations due to health problems, current medical condition).

Control variables included sociodemographic measures of sex, age, race/ethnicity, highest education level, marital status, pay grade, total time in service, branch of service, and a measure of social support. Social support was assessed with a modified version of the Social Network Index.<sup>35</sup> In accordance with scale developers, the standard scoring protocol for the index was followed. Using this scoring protocol, a sociability score was obtained from three items inquiring about the respondent's number of close friends and relatives and was combined with marital status to form the index of intimate ties. Scores from the index of intimate ties were then combined with an organizational membership score and a church membership score to form the Social Network Index.<sup>36</sup>

## Analyses

Because of the complex sampling design, the SUDAAN developed by RTI<sup>37</sup> was used for statistical analysis of the survey data. The CROSSTAB procedure in SUDAAN was used to calculate weighted estimates of percentages and frequencies and estimates of their standard errors. Student's *t* test and  $\chi^2$  tests of association were used to evaluate the gender differences in exposure to trauma events and outcome variables, demographic differences in types of exposures, and associations between outcome variables and exposures. The MULTLOG procedure was used to fit multivariate polytomous logistic regression models to examine the relationships between each of the three summary outcome variables and types of exposure to any traumatic event, controlling for demographic and social support variables. This modeling procedure was used because each of our three summary variables were categorized into three groups consisting of (1) none of the positive factor items, (2) only one positive factor, and (3) combined positive factors or at least two positive factors. The odds ratios and 95% confidence intervals were estimated using each generalized logit equation in comparison with the reference category logit (none of the positive factor items).

## Results

Table I shows the lifetime prevalence of exposure to traumatic events among active duty women and men. Sixty-five percent of the personnel were exposed to at least one traumatic event in their lifetime, with significantly more men than women reporting both any exposure and a greater number of exposures. The main types of exposure experiences were witnessing a major accident involving injuries or fatalities and participating in relief efforts in a natural disaster. Men were significantly more likely than women to report participation in relief efforts, witnessing only, and surviving violence or a major accident. Men and women were equally likely to report being a witness or a survivor of a natural disaster.

As shown in Table II, 30% of the men and 23% of the women had been a victim or survivor of a traumatic event. Relief workers tended to be older, Caucasian, and married; witnesses only were younger and single; victims/survivors were more likely to be in the lowest pay grades.

TABLE I  
LIFETIME EXPOSURE TO DISASTER AND VIOLENCE AMONG MILITARY WOMEN AND MEN

	Women		Men		Total	
	Unweighted No.	Weighted %	Unweighted No.	Weighted %	Unweighted No.	Weighted %
Aggregate						
Any exposure	3,296	52.8 <sup>a</sup>	5,633	67.2 <sup>a</sup>	8,929	65.2
No. of exposures						
0	3,496	47.2 <sup>a</sup>	2,543	32.8 <sup>a</sup>	6,039	34.8
1	1,882	31.9 <sup>a</sup>	2,157	25.4 <sup>a</sup>	4,039	26.3
2	967	14.4 <sup>a</sup>	1,872	23.8 <sup>a</sup>	2,839	22.5
3	447	6.5 <sup>a</sup>	1,604	18.0 <sup>a</sup>	2,051	16.4
Specific exposure						
Natural disaster	2,112	33.8 <sup>a</sup>	3,560	40.3 <sup>a</sup>	5,672	39.4
Witness	1,138	22.1	2,070	24.5	3,208	24.2
Victim	868	14.3	1,312	15.4	2,180	15.3
Involved in relief efforts	1,031	19.7 <sup>a</sup>	2,210	25.4 <sup>a</sup>	3,241	24.6
Combat/violence	961	14.5 <sup>a</sup>	2,994	35.4 <sup>a</sup>	3,955	32.4
Witness	506	9.3 <sup>a</sup>	1,880	24.0 <sup>a</sup>	2,386	21.9
Victim	205	3.2 <sup>a</sup>	686	9.3 <sup>a</sup>	891	8.5
Involved in relief efforts	511	7.5 <sup>a</sup>	1,624	18.5 <sup>a</sup>	2,135	17.0
Used deadly force	42	0.8 <sup>a</sup>	553	6.9 <sup>a</sup>	595	6.1
Major accident	2,101	32.0 <sup>a</sup>	4,214	51.4 <sup>a</sup>	6,315	48.7
Witness	1,124	19.6 <sup>a</sup>	2,736	34.8 <sup>a</sup>	3,860	32.7
Victim	700	9.5 <sup>a</sup>	1,194	14.5 <sup>a</sup>	1,894	13.8
Involved in relief efforts	791	11.4 <sup>a</sup>	1,982	24.2 <sup>a</sup>	2,773	22.4

<sup>a</sup> Gender differences significant at  $p < 0.05$ .

TABLE II  
PERCENT DEMOGRAPHIC DISTRIBUTION OF TYPES OF EXPOSURE TO ANY COMBAT/VIOLENCE, NATURAL DISASTER, OR MAJOR ACCIDENT INVOLVING INJURIES OR FATALITIES

Demographic Variable	Unweighted No.	None	Relief Worker	Witness	Victim	Test Statistic
Sex						
Male	8,219	33.05	23.21	13.98	29.76	$\chi^2 = 57.35, p = 0.0000$
Female	6,804	46.99	15.32	14.38	23.31	
Age (years)						
≤20	895	36.73	13.32	19.64	30.31	$\chi^2 = 39.84, p = 0.0000$
21-25	3,252	41.80	16.49	15.22	26.50	
26-34	5,432	31.68	25.35	13.05	29.91	
35+	5,336	31.80	27.26	11.92	29.02	
Race						
Caucasian, non-Hispanic	7,720	32.65	25.52	13.46	28.38	$\chi^2 = 54.52, p = 0.0000$
African American, non-Hispanic	2,018	40.63	13.88	16.13	29.36	
Hispanic	2,997	38.49	18.49	13.00	30.02	
Other	2,288	38.07	16.06	14.83	31.04	
Pay grade						
E1-E5	6,797	37.30	17.42	14.71	30.57	$\chi^2 = 46.30, p = 0.0006$
E6-E9	4,663	31.07	28.39	12.59	27.94	
Officer	3,563	33.20	28.58	14.00	24.21	
Marital status						
Not married	5,606	37.86	17.43	15.77	28.94	$\chi^2 = 22.14, p = 0.0001$
Married	9,347	33.11	25.09	12.92	28.88	

Table III shows that all original outcome variables were significantly associated with any exposure to violence, natural disaster, or major accident with the exception of mental health visits, suicidal ideation, current smoking, and number of drinks in the past month. Paired comparisons showed victims had a higher depression score, had experienced more negative and less positive life events in the past year, were more dissatisfied with their life as a whole, and were more likely to be a past

smoker than nonexposed respondents. Relief workers had higher levels of life satisfaction and lower levels of alcohol use than victims or witnesses. Witnesses only were much more likely to be current smokers and heavier drinkers. An examination of gender differences showed that men were more likely to report poorer perceived health, more depression symptoms, worse feelings about life as a whole, fewer positive life events, and less social support and were more likely to have been smok-

TABLE III

CORRELATES OF EXPOSURE TO ANY NATURAL DISASTER, COMBAT/VIOLENCE, OR MAJOR ACCIDENT INVOLVING INJURIES/FATALITIES

Original Outcome Variable	Total	None	Relief Worker	Witness	Victim	Test Statistic
Current medical conditions						
2+	16.80	12.92	20.53	13.15	20.47	$\chi^2_6 = 37.82, p = 0.0000$
1	22.70	21.46	20.56	21.81	26.34	
None	60.50	65.62	58.91	65.04	53.19	
Illness or injury visit in past year						
4+	38.42	33.27	40.16	36.83	44.09	$\chi^2_6 = 21.94, p = 0.0013$
1-3	32.76	34.94	31.59	32.68	31.05	
No visit	28.82	31.79	28.25	30.49	24.86	
Mental health visit in past year						
≥1	4.43	3.73	3.41	3.25	6.64	$\chi^2_3 = 6.38, p = 0.0947$
No visit	95.57	96.27	96.59	96.75	93.36	
Self-perceived state of health						
Fair/poor	4.65	3.88	3.74	5.50	5.88	$\chi^2_6 = 15.52, p = 0.0166$
Very good/good	67.48	66.16	66.22	65.91	70.79	
Excellent	27.87	29.96	30.05	28.59	23.33	
Role limits due to emotional problems						
High	17.54	15.68	15.77	17.07	21.40	$\chi^2_3 = 8.98, p = 0.0296$
Low	82.46	84.32	84.23	82.93	78.60	
Role limits due to health problems						
High	22.14	16.83	22.75	25.21	26.65	$\chi^2_3 = 28.72, p = 0.0000$
Low	77.86	83.17	77.25	74.79	73.35	
Depression indicator						
Yes	27.30	26.82	23.06	26.14	31.75	$\chi^2_3 = 11.03, p = 0.0116$
No	72.70	73.18	76.94	73.86	68.25	
Considered suicide within past 2 years						
Yes	6.53	5.39	5.26	6.93	8.71	$\chi^2_3 = 5.55, p = 0.1360$
No	93.47	94.61	94.74	93.07	91.29	
Feelings about life as a whole						
Dissatisfied	4.46	4.69	3.55	1.86	6.11	$\chi^2_6 = 23.08, p = 0.0008$
Mixed	18.92	18.52	15.60	21.09	20.93	
Satisfied	76.62	76.79	80.85	77.04	72.96	
No. difficult problems last year						
Many/several	10.65	7.77	9.42	8.05	16.34	$\chi^2_9 = 50.40, p = 0.0000$
Some	17.63	14.86	20.91	15.81	19.40	
Few	42.98	42.73	40.26	46.50	43.62	
None	28.74	34.64	29.40	29.64	20.64	
Experienced pleasant change past year						
Never	16.15	19.60	13.57	15.42	14.29	$\chi^2_9 = 22.93, p = 0.0064$
Rarely/seldom	41.59	38.87	39.89	43.46	45.27	
Sometimes	34.54	32.43	39.59	34.72	33.18	
Often	7.71	9.09	6.94	6.40	7.27	
Social support indicator						
Low	32.44	36.36	24.87	32.92	33.26	$\chi^2_6 = 28.09, p = 0.0001$
Medium	41.68	41.34	44.87	43.14	38.93	
High	25.88	22.30	30.26	23.94	27.81	
Overall job stress						
High	44.87	37.76	42.68	46.87	54.36	$\chi^2_6 = 47.98, p = 0.0000$
Medium	31.00	34.38	34.80	27.11	25.78	
Low	24.13	27.86	22.52	26.02	19.86	
Smoked at least 100 cigarettes in life						
Yes	44.97	40.50	45.14	46.30	49.62	$\chi^2_3 = 11.61, p = 0.0089$
No	55.03	59.50	54.86	53.70	50.38	
Current smoker						
Yes	28.95	26.31	26.77	34.20	31.30	$\chi^2_3 = 7.32, p = 0.0625$
No	71.05	73.69	73.23	65.80	68.70	
Days drank alcohol in past month						
11+	15.54	11.47	15.91	21.06	17.50	$\chi^2_9 = 29.05, p = 0.0006$
4-10 days	24.38	22.90	23.60	26.63	25.66	
Once	34.57	36.45	36.25	31.55	32.48	
None	25.51	29.18	24.25	20.76	24.36	
No. of alcohol drinks in past month						
5+	15.27	13.71	14.55	18.26	16.28	$\chi^2_9 = 16.02, p = 0.0666$
2-4	35.07	33.68	34.84	37.24	35.88	
1	22.41	21.56	24.69	22.11	21.84	
None	27.24	31.05	25.92	22.38	26.00	

ers than nonexposed controls. Women were more likely to report suicidal ideation and role limitations due to emotional problems than controls.

Table IV shows the results of a series of multivariate logistic regression analyses in which types of exposure to any traumatic event were evaluated for their independent contribution to each psychosocial and health outcome summary or factor variable, controlling for demographic and social support variables. The one vs. no positive factor item model and the two or more vs. no positive factor item model were compared. Results were similar across these two levels of severity and are therefore presented for the two or more vs. no positive factor item level only. In the first model, exposure type predicted having at least two mental health problems (positive factor items). Victims had the greatest risk, and male witnesses and female relief workers had similar but less risk compared with those with no exposure. Enlisted men were at significantly greater risk than officers as were both men and women with lower levels of social support. Younger age and Hispanic ethnicity were protective of mental health problems among men exposed to traumatic events.

In the second model, types of exposures significantly predicted current smoking and alcohol use with witnessing men being 2.5 times as likely as nonexposed men to be smokers and

heavier drinkers. The high-risk profile among men included being Caucasian, single, and enlisted and having low social support. Unlike men, women were at higher risk of smoking and heavier drinking if they had been victims or relief workers, rather than witnesses only. Junior enlisted women had over six times the risk of smoking and/or heavier drinking as female officers and almost twice the risk of enlisted men. Being Caucasian and having low social support were also significant predictors of current smoking and heavier drinking among trauma-exposed women.

In the final model, types of exposures significantly predicted having two or more physical health problems among men, with victims having the highest risk, followed by relief workers, and finally witnesses. Younger age groups, non-Caucasian ethnic/racial groups, and officers were at the lowest risk for multiple health problems among men. Among women, relief workers and victims had the highest risk for two or more physical health problems. Social support did not have an observable effect on the physical health outcome factor for either sex.

To examine whether social support had a moderating effect on any of the three summary outcomes, exposure by social support interaction terms were entered into each model. None of these interaction terms were significant.

TABLE IV

MULTINOMIAL LOGISTIC REGRESSION ANALYSIS OF PSYCHOSOCIAL AND HEALTH FACTORS ON TYPES OF EXPOSURES TO ANY TRAUMATIC EVENT, CONTROLLING FOR DEMOGRAPHIC AND SOCIAL SUPPORT VARIABLES

Exposure and Control Variables	Mental Health <sup>a</sup>		Drinking and Smoking <sup>b</sup>		Physical Health <sup>c</sup>	
	Male	Female	Male	Female	Male	Female
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Exposure to any trauma						
Relief worker	1.31 (0.97-1.76)	1.86 (1.13-3.06) <sup>d</sup>	1.73 (1.06-2.82) <sup>d</sup>	2.40 (1.06-5.43) <sup>d</sup>	1.99 (1.40-2.83) <sup>d</sup>	1.90 (1.14-3.15) <sup>d</sup>
Witness	1.44 (1.01-2.03) <sup>d</sup>	0.99 (0.57-1.73)	2.53 (1.45-4.40) <sup>d</sup>	2.05 (0.96-4.37)	1.69 (1.09-2.61) <sup>d</sup>	1.67 (0.91-3.07)
Victim	1.95 (1.45-2.63) <sup>d</sup>	2.87 (1.93-4.26) <sup>d</sup>	1.86 (1.20-2.89) <sup>d</sup>	2.34 (1.18-4.66) <sup>d</sup>	2.70 (1.92-3.79) <sup>d</sup>	1.79 (1.18-2.73) <sup>d</sup>
None						
Age (years)						
≤20	0.64 (0.37-1.10)	1.25 (0.62-2.53)	0.60 (0.29-1.26)	0.48 (0.13-1.83)	0.47 (0.24-0.94) <sup>d</sup>	0.99 (0.44-2.25)
21-25	0.72 (0.49-1.07)	1.28 (0.74-2.19)	1.39 (0.82-2.36)	0.70 (0.28-1.74)	0.51 (0.32-0.82) <sup>d</sup>	0.65 (0.37-1.15)
26-34	0.67 (0.52-0.87) <sup>d</sup>	0.88 (0.59-1.31)	0.81 (0.54-1.21)	0.55 (0.25-1.23)	0.58 (0.44-0.76) <sup>d</sup>	0.52 (0.34-0.80)
35+						
Race/ethnicity						
Caucasian						
African American	1.10 (0.79-1.53)	1.15 (0.77-1.73)	0.51 (0.30-0.86) <sup>d</sup>	0.25 (0.13-0.47) <sup>d</sup>	0.53 (0.37-0.75) <sup>d</sup>	0.83 (0.55-1.26)
Hispanic	0.74 (0.57-0.98) <sup>d</sup>	0.91 (0.66-1.26)	0.70 (0.44-1.10)	0.33 (0.19-0.57) <sup>d</sup>	0.71 (0.52-0.96) <sup>d</sup>	0.98 (0.70-1.38)
Other	0.92 (0.69-1.22)	1.18 (0.87-1.61)	0.77 (0.53-1.11)	0.41 (0.23-0.70) <sup>d</sup>	0.85 (0.62-1.17)	0.81 (0.58-1.12)
Marital status						
Not married	1.04 (0.76-1.42)	0.84 (0.58-1.20)	1.51 (1.05-2.16) <sup>d</sup>	1.15 (0.58-2.31)	0.93 (0.67-1.30)	1.20 (0.80-1.81)
Married						
Social Support Index						
Low	3.38 (2.32-4.90) <sup>d</sup>	3.81 (2.35-6.16) <sup>d</sup>	2.54 (1.55-4.15) <sup>d</sup>	3.38 (1.47-7.77) <sup>d</sup>	1.22 (0.86-1.75)	1.18 (0.71-1.99)
Medium	1.52 (1.16-2.00) <sup>d</sup>	1.98 (1.31-3.00) <sup>d</sup>	1.63 (1.06-2.51) <sup>d</sup>	1.37 (0.66-2.85)	1.21 (0.91-1.63)	1.31 (0.86-1.98)
High						

OR, odds ratio; CI, confidence interval.

<sup>a</sup> Factor coded as 1 for each of the following: depression symptoms  $\geq 5$ , at least one mental health visit in past year, high score on role limitations due to emotional problems, ever considered suicide in past 2 years, dissatisfied with feelings about life as a whole, many/several/some difficult problems in past year, never experienced a pleasant change in past year.

<sup>b</sup> Factor coded as 1 for each of the following: current smoker, drank on 11 or more days in past month (at least 3-4 days a week, average), or drank five or more drinks on a typical day.

<sup>c</sup> Factor coded as 1 for each of the following: fair or poor perception of health, five or more visits for illness or injury, high score on role limitations due to health problems, and two or more current medical conditions.

<sup>d</sup> Significant at 95% confidence level.

## Discussion

This study has shown that among active duty U.S. military personnel, the lifetime exposure to one or more traumatic events was 65%. The prevalence rates of exposure varied by type of trauma (violence, natural disaster/major accident), type of exposure (relief worker, witness, survivor/victim), and gender; the most prevalent trauma for men was witnessing a major accident and for women it was witnessing a natural disaster. Numerous psychosocial and health correlates of traumatic event exposures were identified, and these also varied with type of trauma, exposure, and gender. In multivariate analyses, whereas male victims/survivors of any traumatic event had over twice the risk of two or more physical health problems, female victims/survivors had over twice the risk of two or more mental health problems relative to nonexposed controls. Among trauma-exposed men, those who reported only witnessing one or more traumatic events were at twice the risk for current smoking and heavier drinking, whereas among women, victims and relief workers were at the highest risk after controlling for demographic and social support variables.

Partial support was obtained for the hypothesis that exposure to violence would be associated with poorer perceived health and psychosocial functioning than exposure to natural disaster or major accident. Violence, but not natural disaster/major accident exposure, was associated with fewer positive life events and heavier drinking at the bivariate level. Exposure to natural disaster/major accident, but not violence, was associated with role limitations due to emotional problems and current smoking (data not shown). In multivariate analyses, support was found for the hypothesis that survivors/victims would have poorer outcomes than witnesses or relief workers but was specific to mental health outcomes among women and physical health outcomes among men. Consistent with the literature, relief workers were at greater risk for mental, physical, and substance use problems than nonexposed personnel. The only exception was the group of male relief workers who did not differ in their mental health from nonexposed personnel and whom may be more desensitized than other groups.

Of interest was the role social support may play in this study. Several investigators have noted the importance of examining the effect of social support on responses to traumatic events.<sup>38,39</sup> In the present study, low social support was associated with at least one mental health problem and with substance use but not with physical health problems after controlling for demographic variables, and there was no evidence of a moderating effect. This finding suggests that the structural type of social support measured in the current study had a direct effect and is in contrast to the findings by Murphy,<sup>40</sup> who noted no significant main effects on mental health for the more functional social support examined among natural disaster victims.

The 65% lifetime prevalence rate of trauma exposure falls in the midrange of other studies that have estimated the prevalence of exposure to trauma.<sup>3</sup> It also compares with the 67% found among a student sample in Israel.<sup>39</sup> Consistent with studies of civilian populations, male respondents had a higher prevalence of trauma exposure than females.<sup>4,41</sup> Remarkably, the rates for active duty men and women in the present study varied little from those for civilians reported by the National Comorbidity Survey (67.2% vs. 60.7% for men; 52.8% vs. 51.2% for

women, respectively), despite differences in measures of traumatic event exposure.<sup>1,42</sup> Also consistent with the National Comorbidity Survey, and unlike community studies that have not specifically examined effects of witnessing a traumatic event, women's highest trauma exposure rates were for witnessing natural disasters and major accidents.

At variance with some of the previous trauma literature is the relatively weak mental health effects shown in the present study. Neither mental health provider visits nor suicidal ideation was significantly associated with the major trauma categories, and only depression was associated with the combined exposure to any traumatic event category. The finding, however, of trauma exposure associations with negative life events and feelings about life as a whole, role limitations due to emotional problems, and high levels of reported job stress suggest that respondents exposed to traumatic events may be more willing to acknowledge or endorse symptoms of an apparent milder emotional distress rather than the more specific mental health questionnaire items. This may be due, at least in part, to the nature of the military population for which there may be greater expectations to cope with traumatic events, greater stigma associated with mental disorder, and multiple types of exposures. As found in a study of Israeli university students, being exposed to multiple types of traumatic events was associated with lowering of distress.<sup>39</sup> In the present study, 23.8% of the men were exposed to two types of traumatic events compared with 14.5% of the men in the National Comorbidity Survey.<sup>1</sup> It is possible that a military population becomes more desensitized to trauma and less reactive with multiple exposures. A low rate of psychiatric disorder was also found among St. Louis disaster victims, which suggested that disasters were not responsible for the development of new psychiatric disorders or symptoms.<sup>43</sup> On the other hand, multiple exposures to interpersonal traumas have been associated with greater psychological distress symptoms among college women for which investigators suggested there may be a threshold effect for coping with repeated events.<sup>44</sup> In light of recent homicides/suicides among Fort Bragg soldiers who returned from Afghanistan, the present results may have deployment screening implications that vary by gender. Certainly, further research in this area is warranted to better understand potential risk and protective effects.

One of the most unique findings of this study was the higher risk for current smoking and heavier drinking among the male witnesses of traumatic events and the nonsignificant effect for female witnesses. This finding was consistent across types of traumatic event exposures and, as shown in the multivariate analyses, was not accounted for by younger age. Although one previous study found that persons indirectly exposed to a disaster had higher but not statistically significant different rates of mental disorder than persons nonexposed<sup>43</sup> and another study found that smoking was related to exposure to abuse and violence,<sup>16</sup> the present study is the first to find that male witnesses to a traumatic event were significantly more likely to be current smokers and heavy drinkers than victims/survivors. It may be that such substance use serves as a defense mechanism to cope with guilt feelings associated with not being more directly involved in the event (i.e., being neither a victim nor a helper). It is also consistent with previous work that found exposure to



harmful physical situations to be the main psychosocial predictor of nicotine dependence among naval service personnel.<sup>45</sup>

Limitations of this study include a response rate that was less than optimal but typical for military surveys, the retrospective reporting of traumatic exposures that may be influenced by current state of health and/or by recall errors, and the use of a nonstandardized and general measure of trauma exposure that limits the comparability of results from this to other studies. Despite these cautionary factors, this study's large, employed population-based sample, its comparison of multiple types of traumatic events and multiple types of exposures, and the numerous potential outcomes from many standardized instruments confer advantages over other epidemiologic investigations of disaster effects.

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